IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	Bautista et al.	) Art Unit:	3653
Serial Number	10/678,186	) Examiner:	M. Beauchaine
Filed	October 6, 2003	) Atty Docket:	DIX009-162

For: Ultrasonic Sensor for Detecting the Dispensing of a Product

AFFIDAVIT SUBMITTED UNDER 37 C.F.R. 1.131

Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

We, Thomas Roger Meinardi and Joshua Robert Powell are the signing inventors for the above-identified U.S. patent application entitled Ultrasonic Sensor for Detecting the Dispensing of a Product which was filed on October 6, 2003 and claimed the benefit of a provisional patent application filed on October 4, 2002. The invention was conceived at least as early as the summer of 2000 as evidenced by the attached invention disclosure form. The present invention is owned by Maytag Corporation and was diligently worked on in connection with the production of a vending machine (reduction to practice) that was utilized to test the ultrasonic sensing arrangement at least as early as May 14, 2001. Evidence of this reduction to practice can also be found in the attached invention disclosure materials.

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under *section 1001 of title*

18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 10/14/2005

Thomas Roger Meinardi

201 Hopeland Farms Drive
Aiken, SC 29803

Date: 10/14/05

Joshua Robert Powell

184 Governors Lane
Aiken, SC 29801

DISCLOSURE OF IDEA

Dixie-Narco

DISCLOSURE NO. DN02-010
ORIGINATED AT Maytag and Admiral Products

PLEASE COMPLETE IN INK AND SIGN, THEN FORWARD TO THE PATENT ADMINISTRATOR

1. *TITLE OF IDEA*

   Ultrasonic Vend Sensor

2. *NAME(S) OF PERSON(S) MAKING DISCLOSURE* (Printed or typed.)

   Dexter V. Bautista

3. *DATE OF CONCEPTION OF IDEA* (Identify and attach any supporting documents.)

   Summer 2000

4. *OBJECT AND DESCRIPTION OF IDEA* (Identify and attach any additional information which may be helpful in understanding and evaluating the idea including any earlier written description.)

   SEE ATTACHED DOCUMENT

5. *DRAWING OR DIAGRAM* (Identify and attach any prior drawings including the earliest drawing or sketch.)

SEE SCHEMATIC.

6. *PRIOR ART* (Identify any products, patents and publications of which you are aware that are related to the idea and prior to your conception.)

SEE APPENDIX B of ATTACHED DOCUMENT

7. *USE OF IDEA* (Identify product and/or development project to which the idea relates.)

Pegasus Project - under Paul Kelly

8. *DISCLOSURE TO OTHERS* (Identify any disclosure of the idea to the public or to personnel outside of Maytag Corporation.)

9. *PRODUCTION USE* (Provide date of production or release for production of product including the idea, if any.)

4th Quarter 2002

10. *WITNESSES* (Persons to whom the idea has been disclosed, who understand it, and have read the disclosure.)

EXPLAINED TO AND UNDERSTOOD BY ME:

Name of Witness (Printed or Typed)	Date of First Disclosure	Date of Signature	Signature of Witness
Jerry R Baacke	6/17/2002	6/17/2002	Jerry R Baacke
Christopher D. Shenyo	6/17/02	6/17/02	Christopher D Shenyo

11. *SIGNATURE(S) OF INVENTOR(S)*
[By signing below I indicate that I believe that I am an inventor of the above-disclosed invention and that it is assignable to Maytag Corporation.]

Name of Inventor (Printed or Typed)	Date of Signature	Signature of Inventor(s)
DEXTER V BAUTISTA	6/17/2002	Dexter V. Bautista
JOSH R POWELL	6/17/2002	Josh R Powell
THOMAS R MEINARDI	6/17/2002	Thomas R Meinardi

Noted: _____ _____

Dixie-Narco®

Disclosure of Idea

Ultrasonic Vend Sensor

June 13, 2002

Written By: Dexter V. Bautista

Filename: Disclosure of Idea _ Ultrasonic Vend Sensor.doc

Table of Contents

Introduction

Objective

The Ultrasonic Vend Sensor is designed to:

- Detect vending products as they roll/fall out of various delivery chutes(a motion detector) without being affected by condensation or drink residue.
- Eliminate the need to use a sold out paddle system in desired applications, thus eliminating 20 moving parts and one 12 conductor harness in a stack vending machine.
- Accomplish the above without sacrificing vendor security.
- Detect intruders stealing products.

Theory of Operation

The sensor works on the principle of sound using a speaker and a microphone that operate at sound frequencies above human hearing (*ultrasonic sound*). Product rolling/falling between the speaker and microphone dampens the distinct sound generated from the speaker(a decrease in volume). The electronic circuit detects the decrease in volume heard by the microphone and sends a product detected signal to the *Vending Machine Controller* (see figure 1).

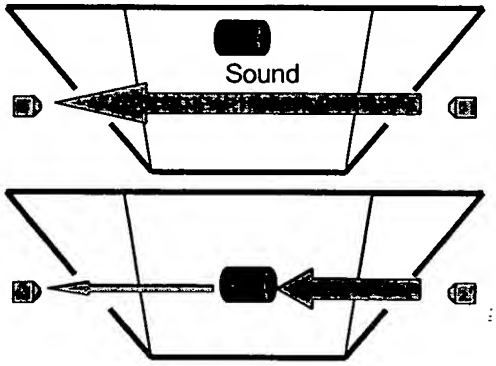


Figure 1

System Components

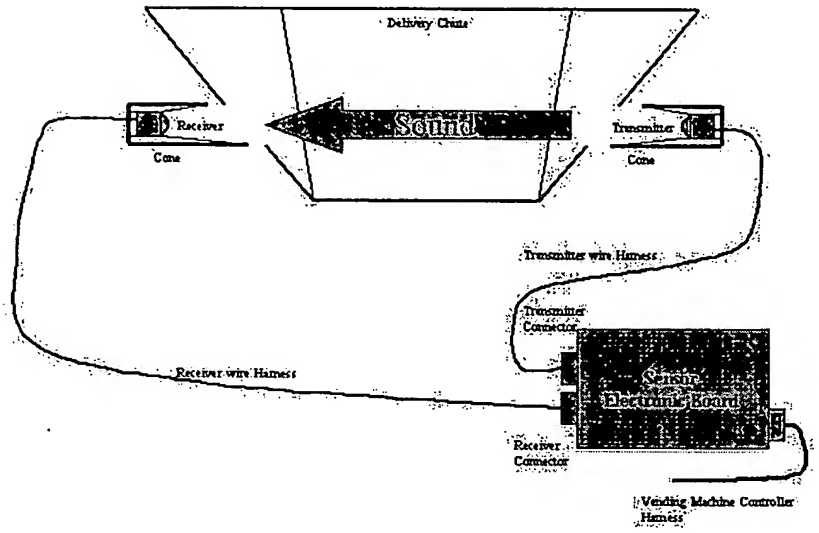


Figure 2

Cone: Used to focus the sound wave

Electronic Board: The Ultrasonic Sensor's Brain.

Receiver: A microphone that operates at sound frequencies above human hearing.

Receiver Wire Harness: Connects the Receiver to the Electronic Board using 2 wires.

Receiver Connector: A two pin connector to connect the Receiver Harness to the Electronic Board.

Transmitter: An audio speaker that operates at sound frequencies above human hearing.

Transmitter Wire Harness: Connects the Transmitter to the Electronic Board using 2 wires.

Transmitter Connector: A two pin connector to connect the Transmitter Harness to the Electronic Board.

Vending Machine Controller Harness: A three pin connector to connect the Vending Machine Controller to the Sensor Electronic Board.

Vending Machine Controller: The Vending Machines main computer.

Electrical Design

Ultrasonic Transducers

The Ultrasonic Transducers should have the following specifications:

- Water resistant
- 40 kHz center frequency.

Sensor Electronic Detection

The sensor electronics uses a *Phase Lock Loop* (PLL) semiconductor chip to detect the presence or non-presence of the 40 kHz sound waves generated by the transmitter. The receiver signal is amplified and passed to the PLL. The PLL processes the signal and determines if the signal is periodic and if the signal strength is above a predetermined threshold. If the signal is not periodic or the signal strength is below the determined threshold, an open collector transistor is toggled to conduct to ground. This open collector transistor provides the Vending Machine Controller with the vend detection signal.

Detection Signal to *Vending Machine Controller*

The Vend Sensor detection signal should be active low.

Mechanical Design

Positive Mechanical Side Effect

The Ultrasonic Vend Sensor may also be used as a shock when mounted on a flexible chute. During preliminary observations of mounting the sensor to a plastic chute, it was shown that the sensor activates when products such as cans or plastic bottles drops onto the chute. It was determined that impact of a product onto the chute flexes the chute bending the sensor out of alignment momentarily until the chute flexes back into shape(see figure 3). This momentary change in alignment is perceived as motion by the ultrasonic sensor. This is a positive side effect. Additionally, external shaking of the vending machine will not trigger the sensor.

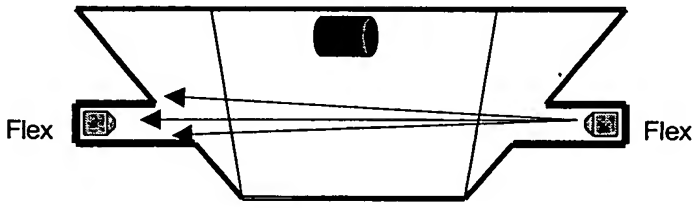


Figure 3

A list of sensor responses to the vending process are shown below:

1) Product dropping onto plastic chute activates sensor.

2) Product passing between ultrasonic speaker and microphone activates sensor.

Sensor Mounting Considerations

Position in Chute

The Ultrasonic Transducers should be mounted as close to the delivery port door as possible and at a height about 1 inch above the chute.

Alignment

The Ultrasonic receiver (the microphone) and transmitter(speaker) should be aligned axially to a tolerance to be determined.

Cone Design

The Ultrasonic Receiver and Ultrasonic Transmitter will be housed in separate plastic cones facing each other. The cones are used to focus the generated sound towards the Ultrasonic Receiver. Focusing essentially boosts the volume of the transmitter making it hard to hear externally generated ultrasonic sound.

Appendix A –Testing Results

Brenda Butts Concept Feasibility Test with Prototype 1

ENGINEERING LABORATORY TEST SUMMARY

TEST NO.:	2001-271	MODEL:	DN 600E Coke
DATE:	4/25/01	SERIAL NO.:	0933-6581DX
EWR NO.:	5738		
		MODEL:	
	Brenda Butts	SERIAL NO.:	

TYPE OF TESTING		REPORT STATUS	
[ ]	REFRIGERATION	[ ]	PRELIMINARY
[X]	VENDING	[X]	FINAL
[X]	OTHER	[ ]	NEED ENGINEERING ASSISTANCE

RESULTS

A test was conducted to evaluate the vend sensor with the evacuation of cans, glass and plastic bottles through the port door. One full load of each type of package was vended with no failures.

Verification of Circuit Design for Water Sealed Transducers

Installation May 14, 2001:

Aron Lewis and Dexter Bautista retrofitted two 600 E model machines with Vend Sensor Prototype 2. The 600 E model machines are outfitted with DC motors and plastic chutes.

Problems during installation: Gloria's machine has a defective cabinet or door. Initially closing the door pushes the plastic chute into a defective evaporator fan housing. The evaporator fans blades cyclically collide with the fan housing and transfer the shock to the chute, which in turn transfers shock into the ultrasonic transducer brackets that lightly touch the chute. Aron solved the problem by removing the plastic holding screws from both brackets. The transducers were then held in place by duck tape.

Testers assigned to execute the test are Gloria and Williemay.

Observations: Jingling a ring of car keys five inches from the port door will activate the sensor.

Testing May 14, 2001: The sensor worked flawlessly.

Testing May 15, 2001 8:30 AM: Williemay's vend sensor would not reset. Proper alignment of the transducers was confirmed. It is not determined what prevented the sensor from resetting. A possible cause might be Fork Lifts passing by. Except for this brief instance, both machines operated properly.

May 16, 2001 observation: Dropping five stacked Pepsi plastic crates onto a concrete floor will activate the sensor while the door is open. However, the sensor will not activate if the door is closed.

May 17, 2001 7:30 AM: Gloria's machine jammed a bottle in rotor number 5. The column is now up and running. The vend sensor is still operating properly on both vendors.

May 23, 2001: Consideration of the use of a focal tube was placed back into the design. It was determined that jingling of keys resonates the receiver in the 40 KHz range. This external noise superimposes itself on the transmitter signal thus canceling out the signal. A four-inch focal tube on the receiver dampens all external noise at an angle of the sensing path. This tube should be sufficient to defeat any external noise.

Appendix B –Prior Art

US 20010000408A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2001/0000408 A1

Hair, III et al. (43) Pub. Date: Apr. 26, 2001

(54) OPTICAL VEND-SENSING SYSTEM FOR CONTROL OF VENDING MACHINE

(75) Inventors: James M. Hair III, Cheyenne, WY (US); Kyriakos P. Spentzos, Santa Rosa, CA (US)

Correspondence Address:
Pillsbury Madison & Sutro LLP
Intellectual Property Group
Ninth Floor
1100 New York Avenue, NW
Washington, DC 20005-3918 (US)

(73) Assignee: Automated Merchandising Systems

(21) Appl. No.: 09/729,853

(22) Filed: Dec. 6, 2000

Related U.S. Application Data

(60) Division of application No. 09/261,221, filed on Mar. 3, 1999, which is a non-provisional of provisional application No. 60/083,522, filed on Apr. 29, 1998.

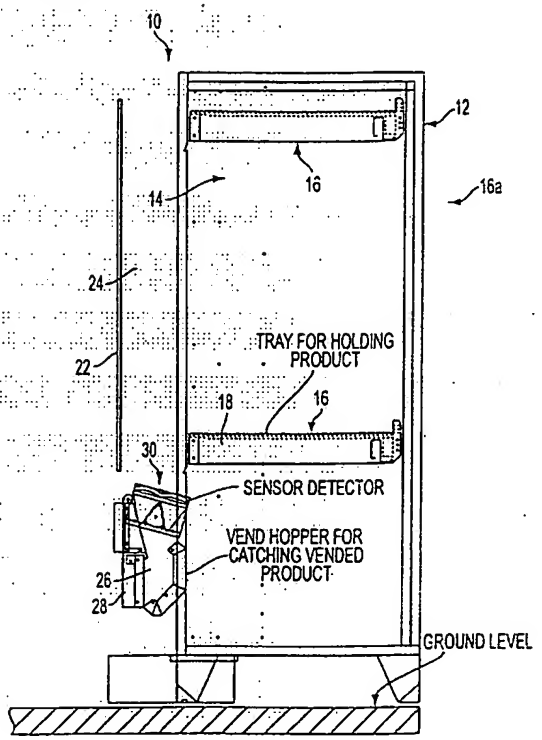
Publication Classification

(51) Int. Cl.[7] G07F 11/00; B65H 3/60; G01V 8/00; G01N 21/86

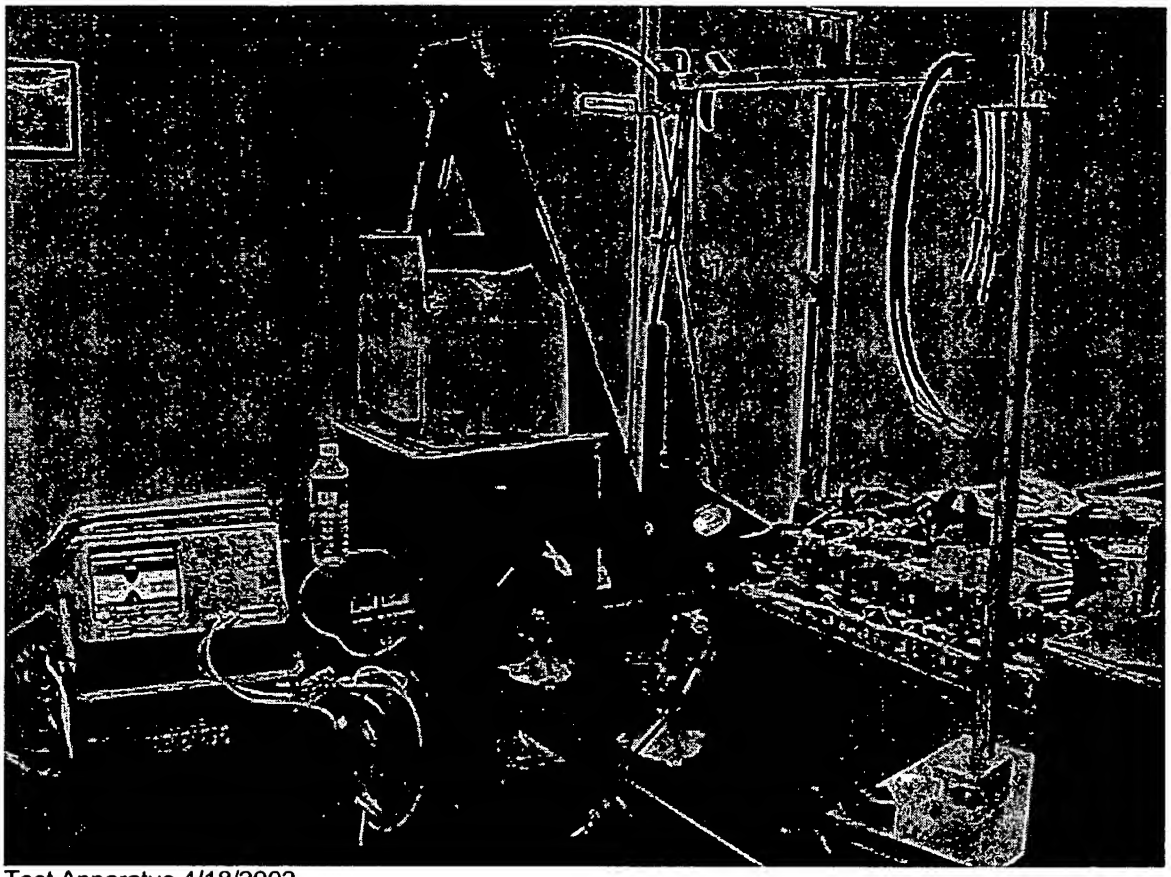
(52) U.S. Cl. 250/224; 250/559.29; 221/200; 221/13

(57) ABSTRACT

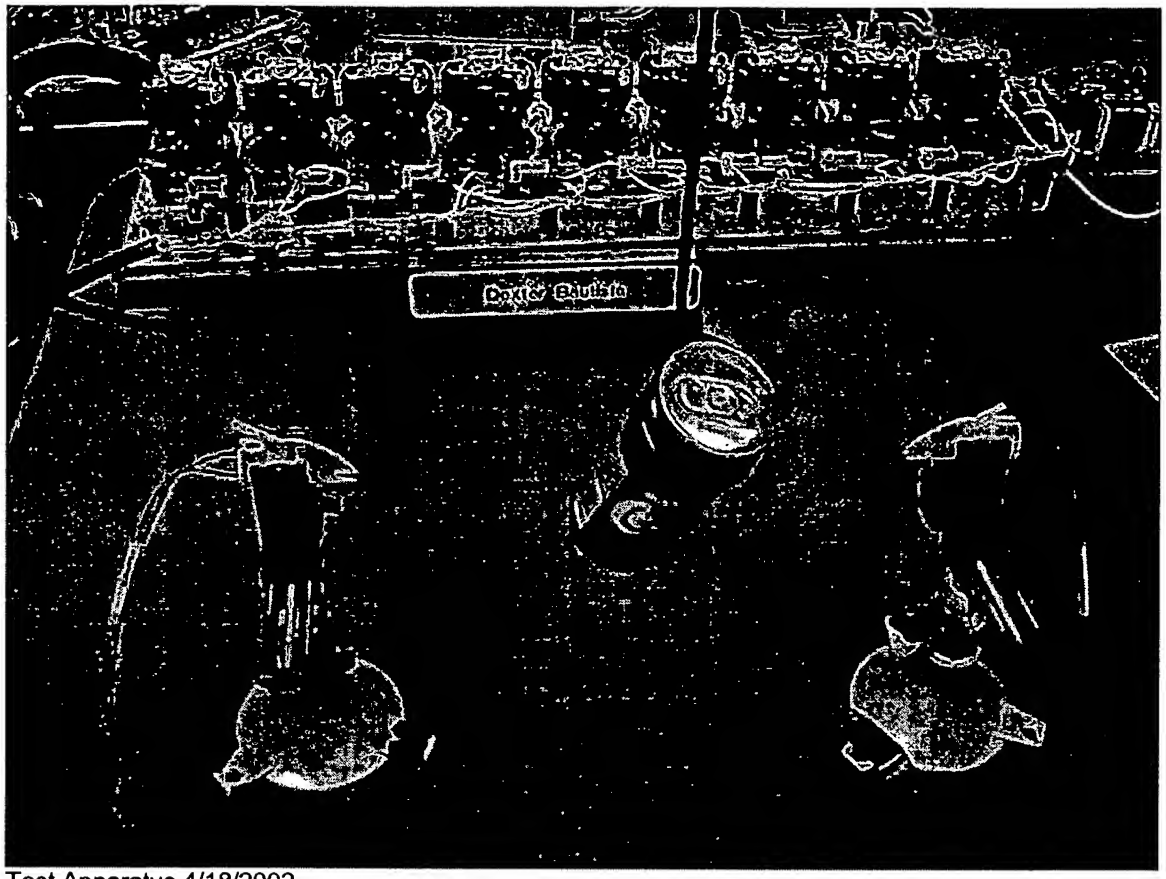
For ensuring that a vending machine motor will continue to operate until a product has descended through a vending space or an established time interval has elapsed, an optical beam is established across the vend space through which a product must drop. A change in beam intensity is detected. By preference infra red light is emitted at one focal point of an elliptical reflector, and detected at the other focal point. The light is emitted in pulses in the preferred embodiment, and the optical sensing system has automated calibration and error detecting functions.



Appendix C – Transducer Evaluation



Test Apparatus 4/18/2002



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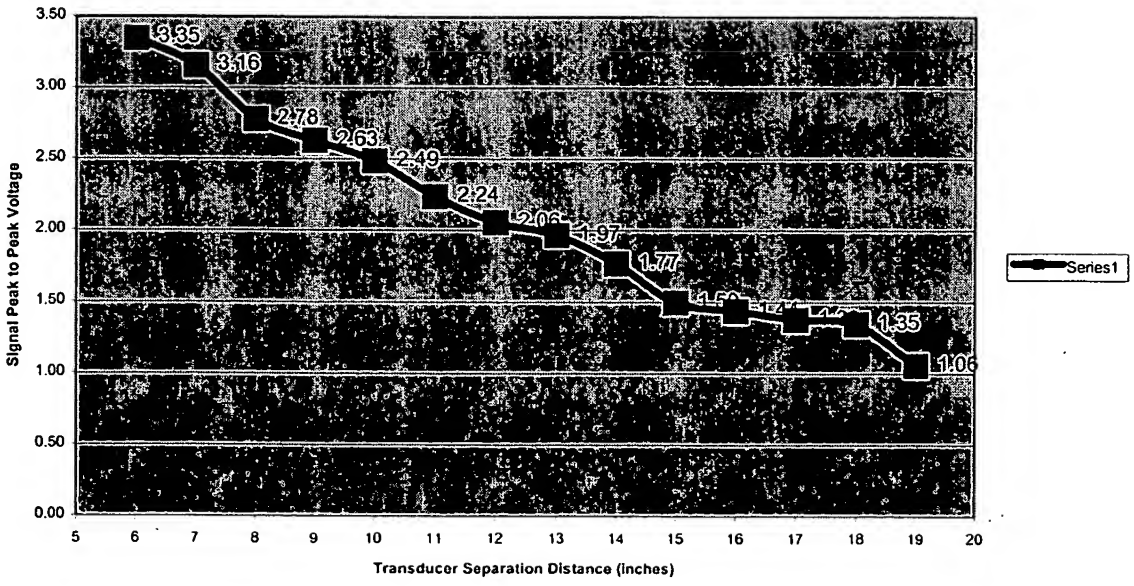
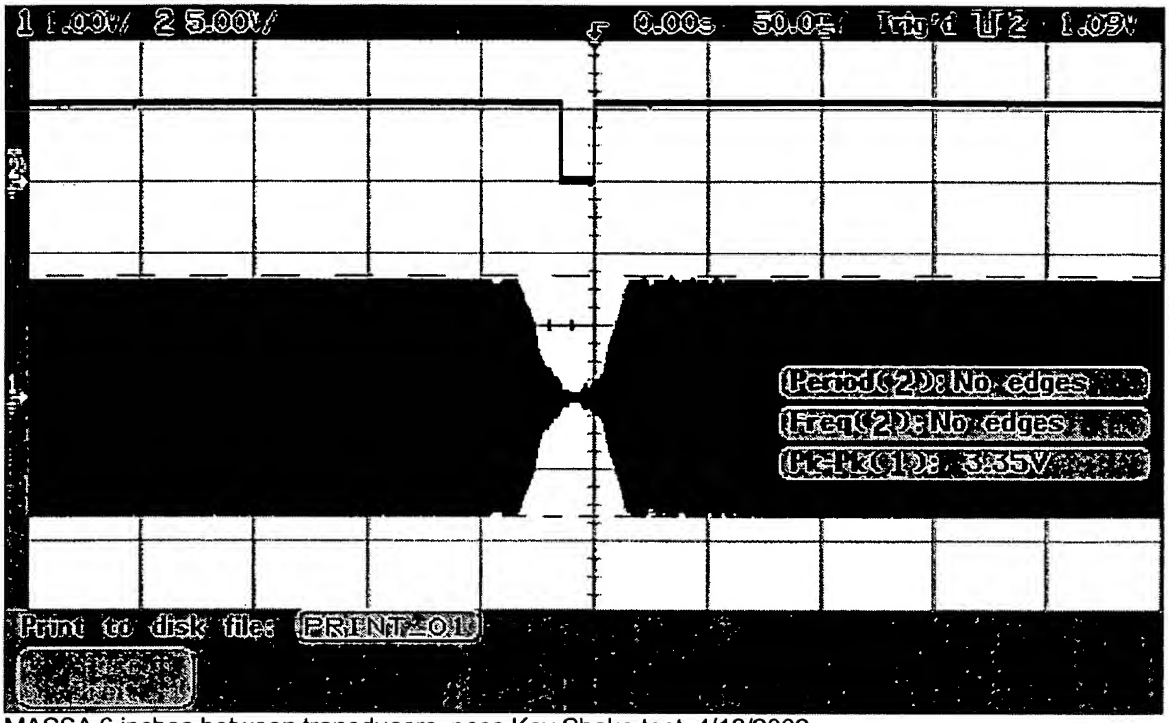
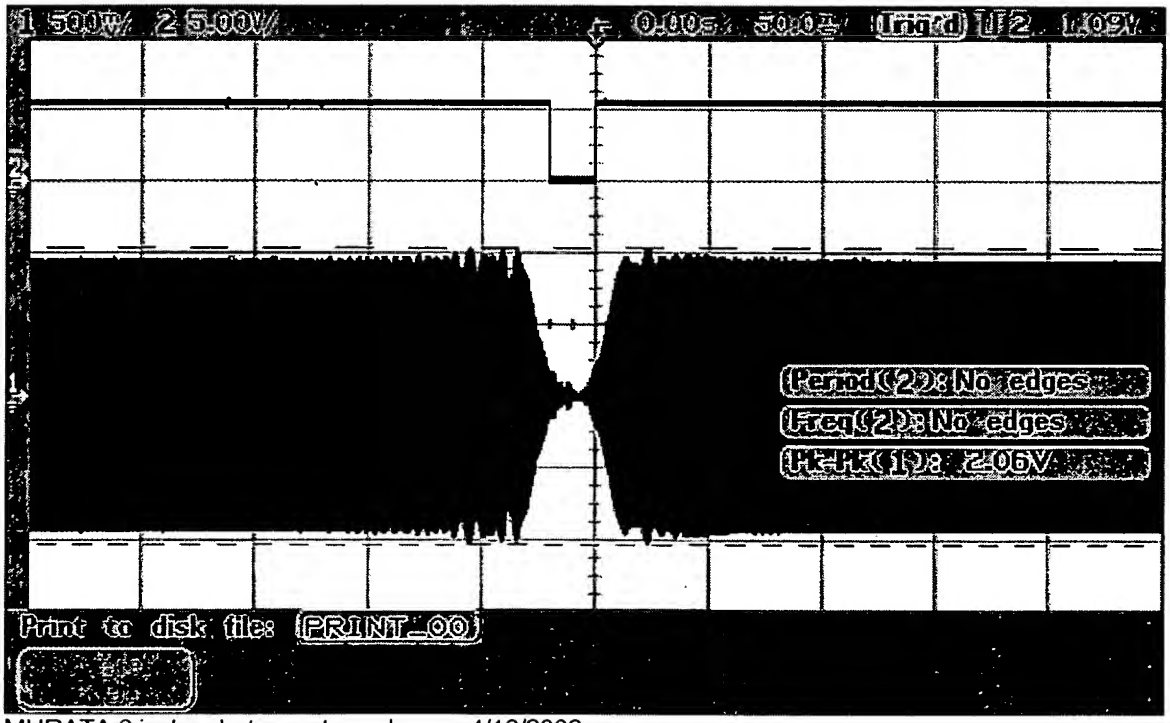




MASSA 6 inches between transducers, pass Key Shake test. 4/18/2002



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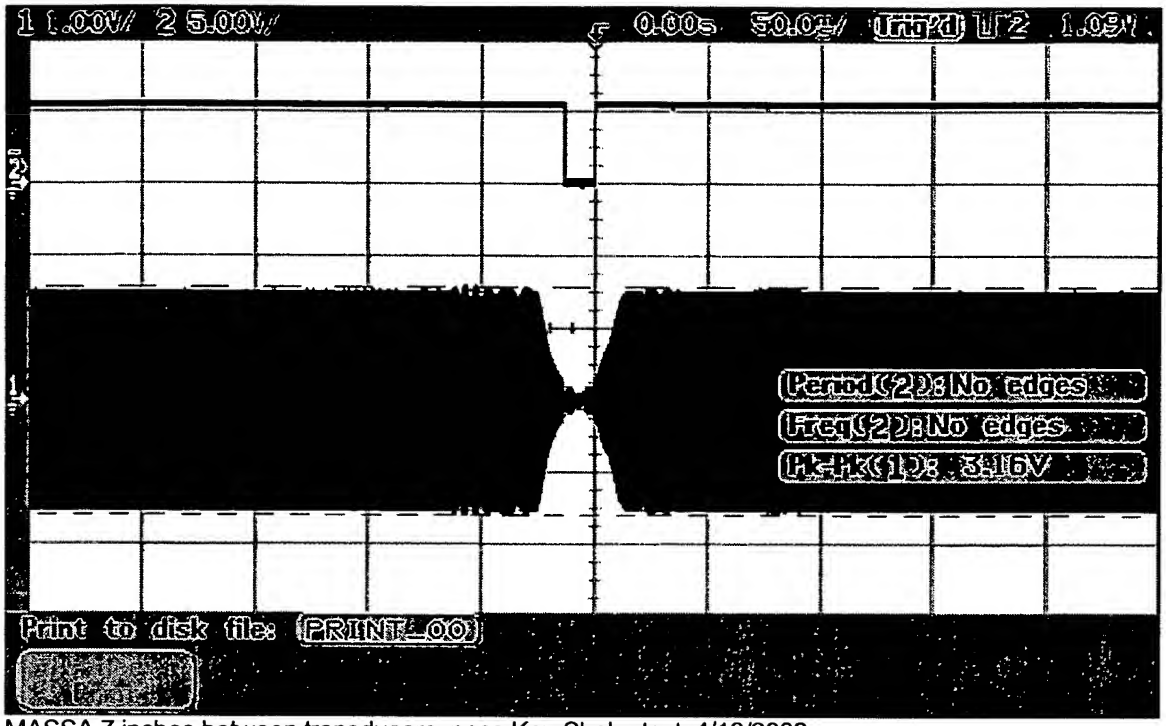

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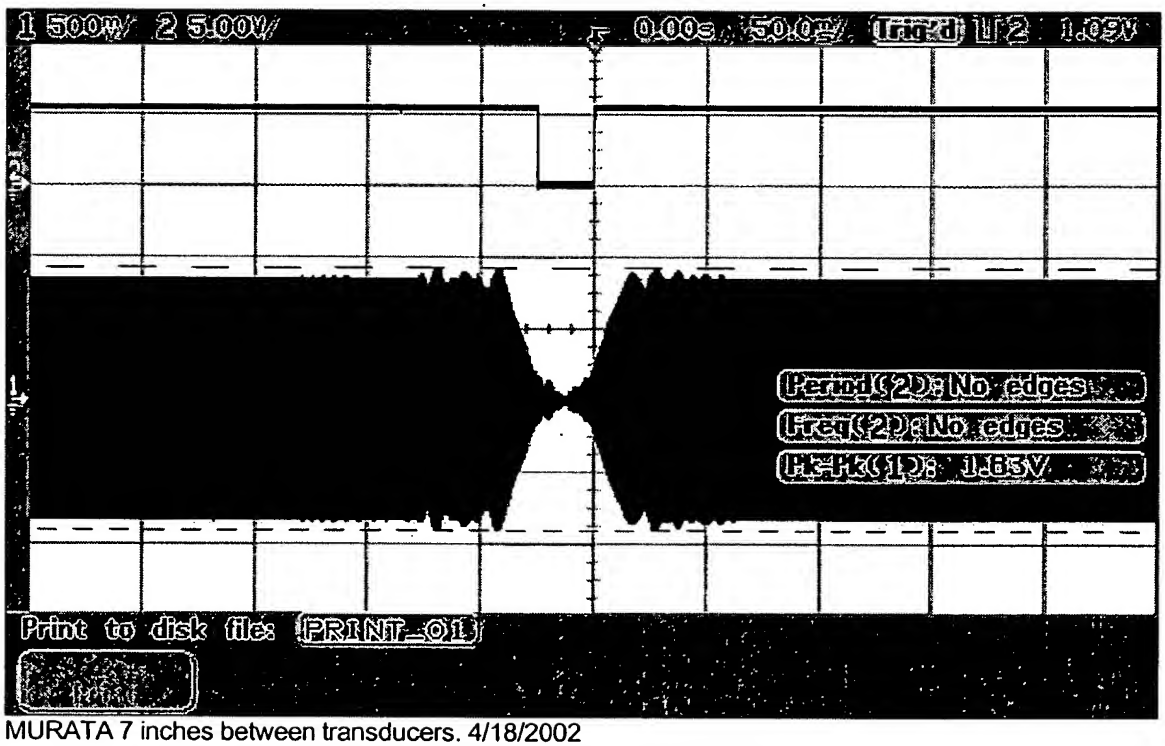

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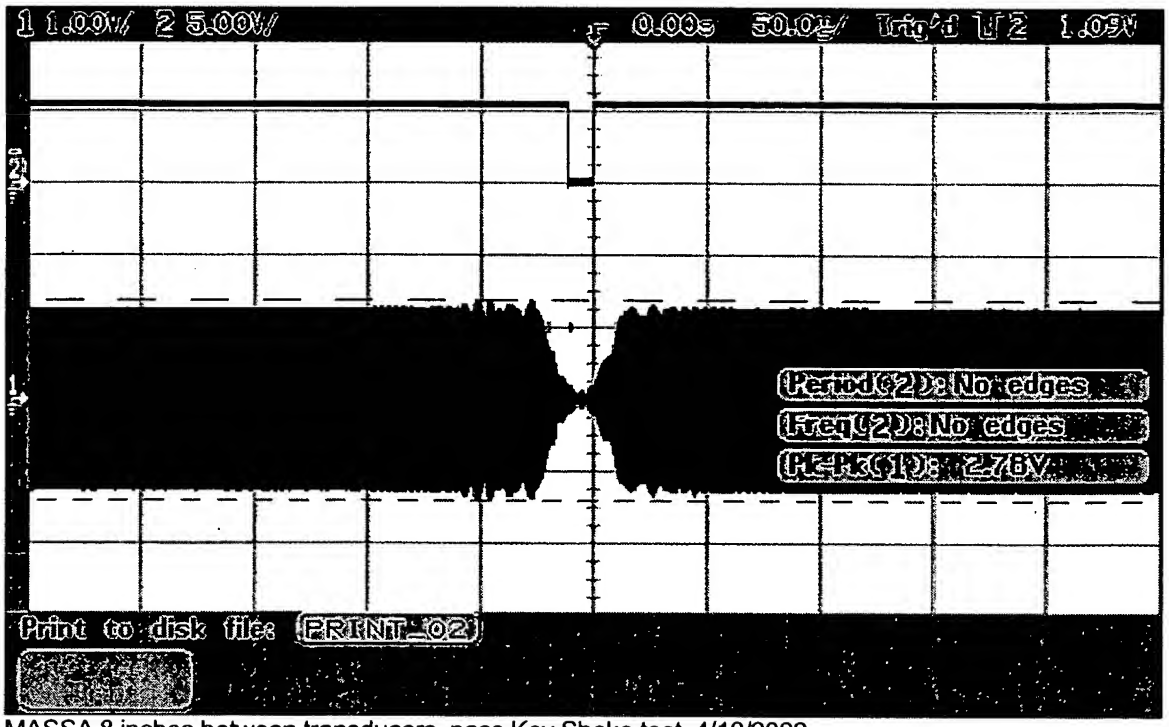

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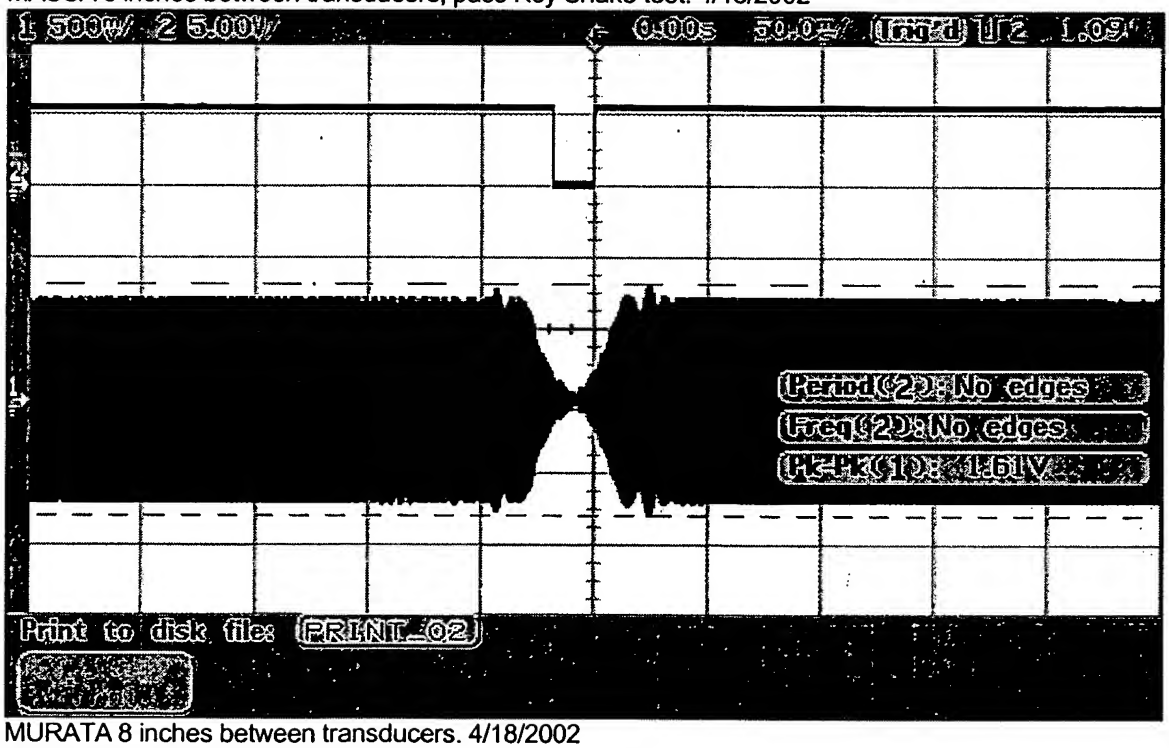

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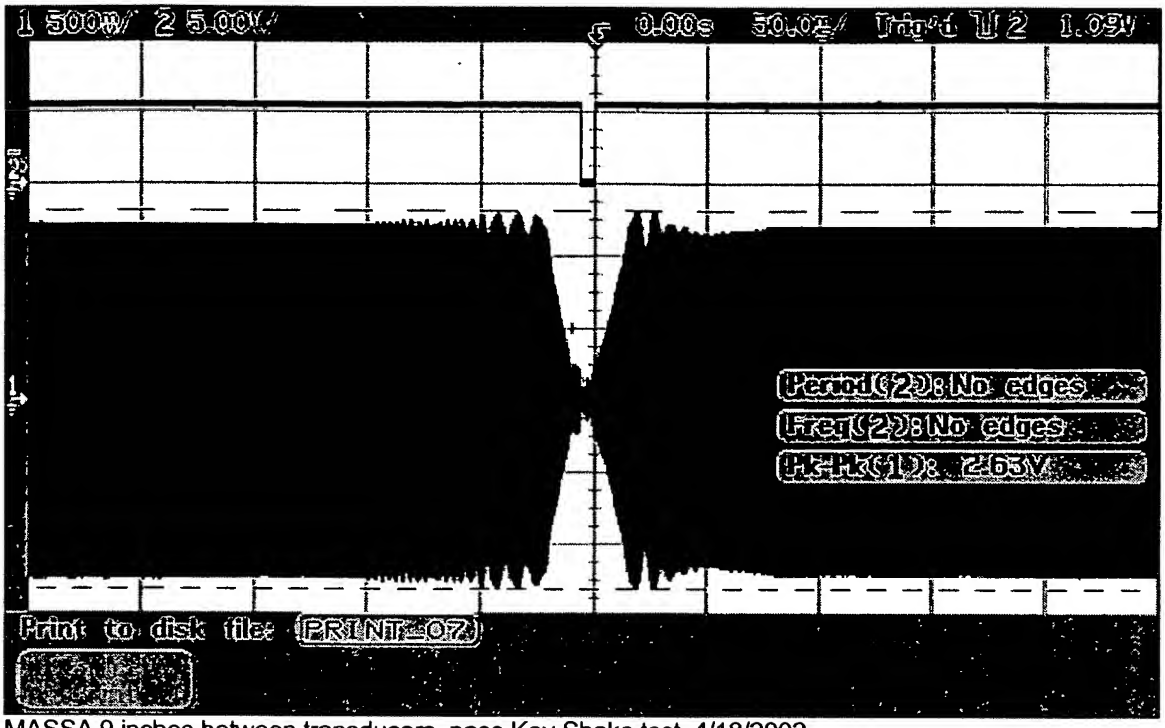

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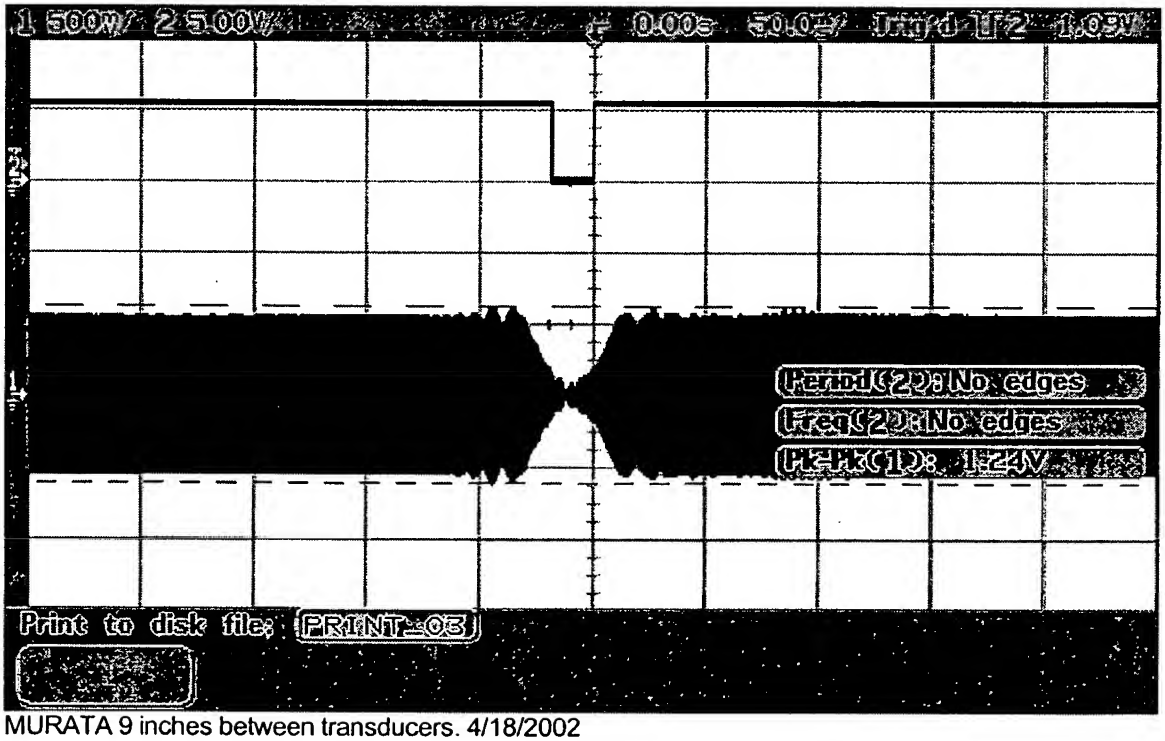

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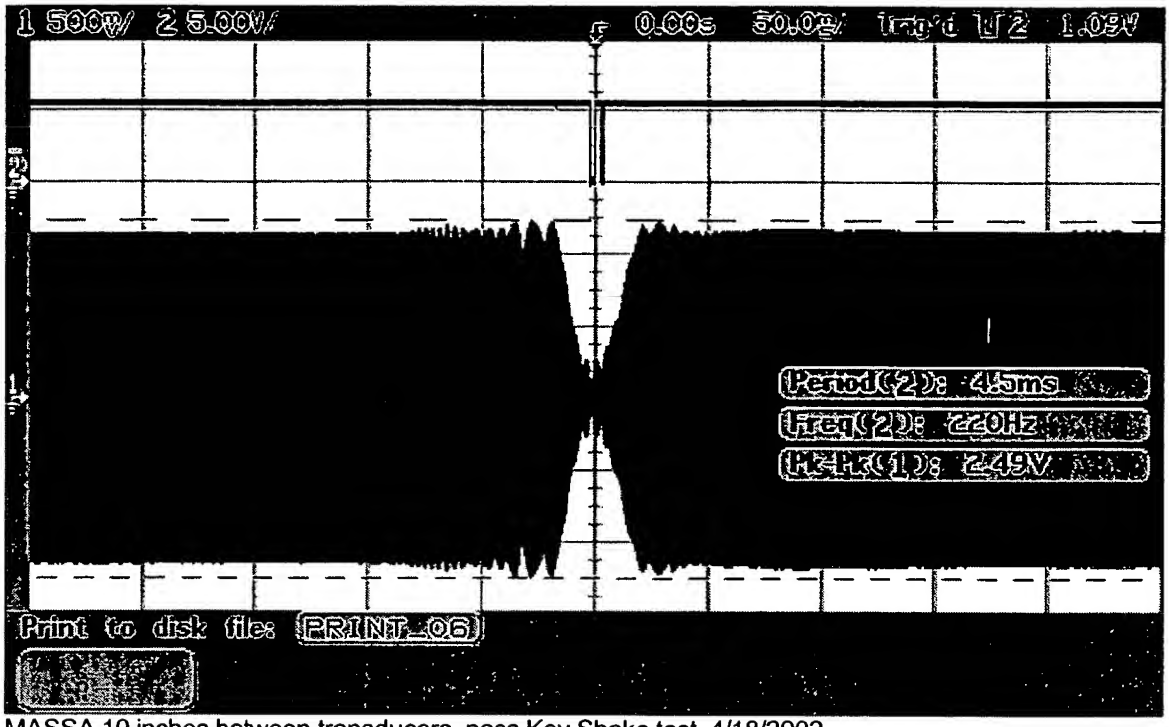

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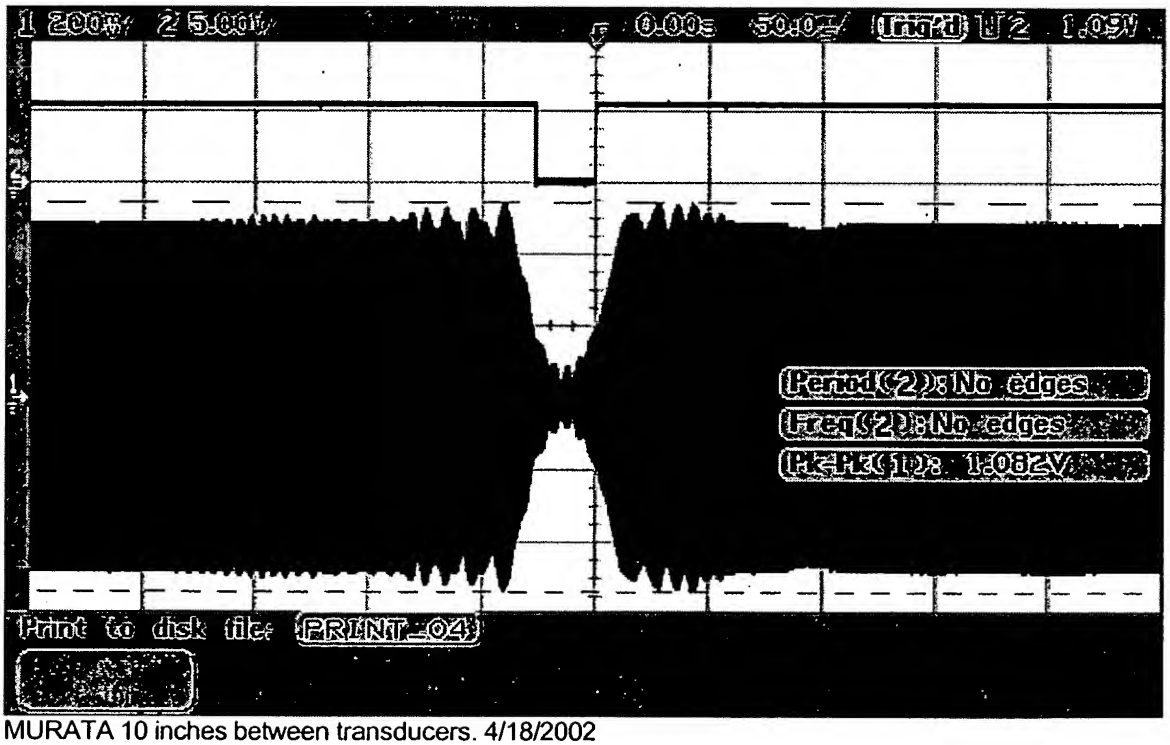

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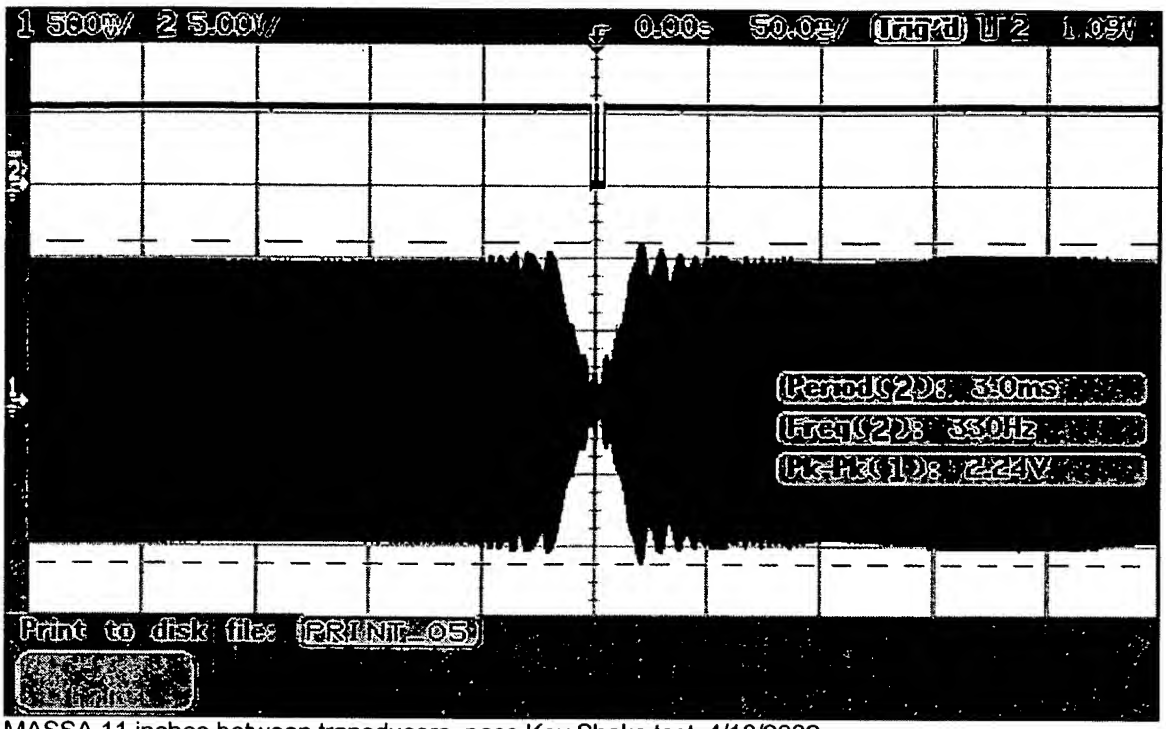

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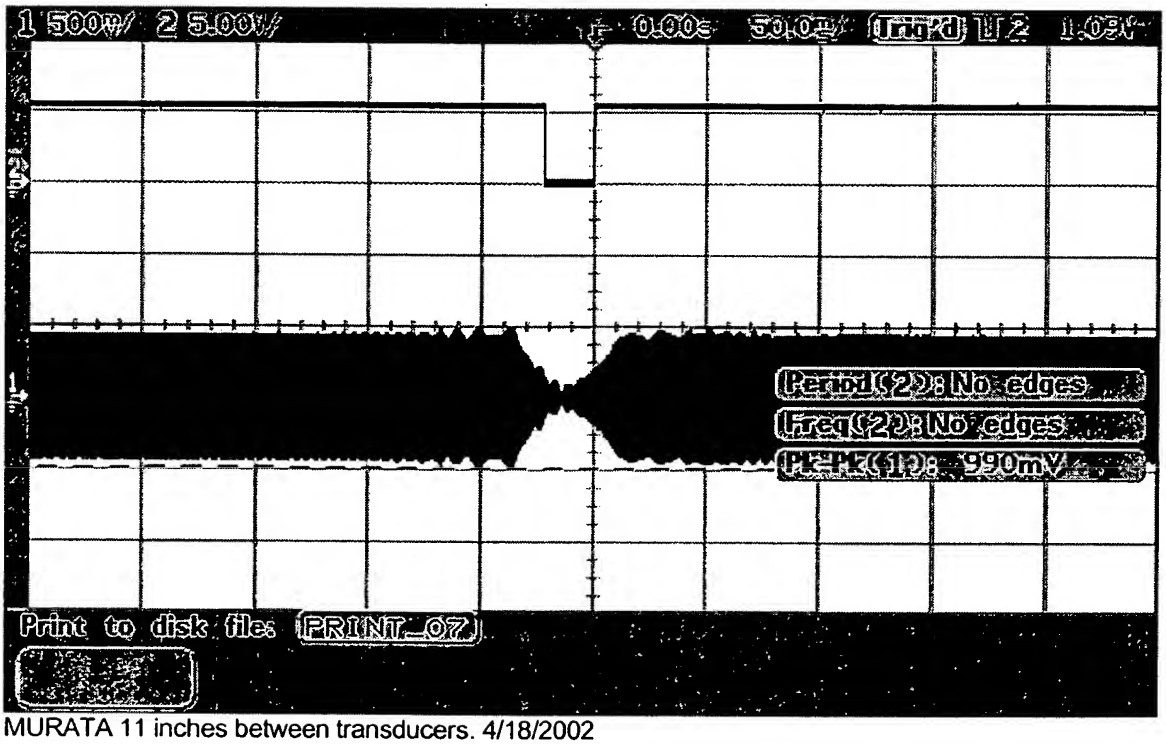

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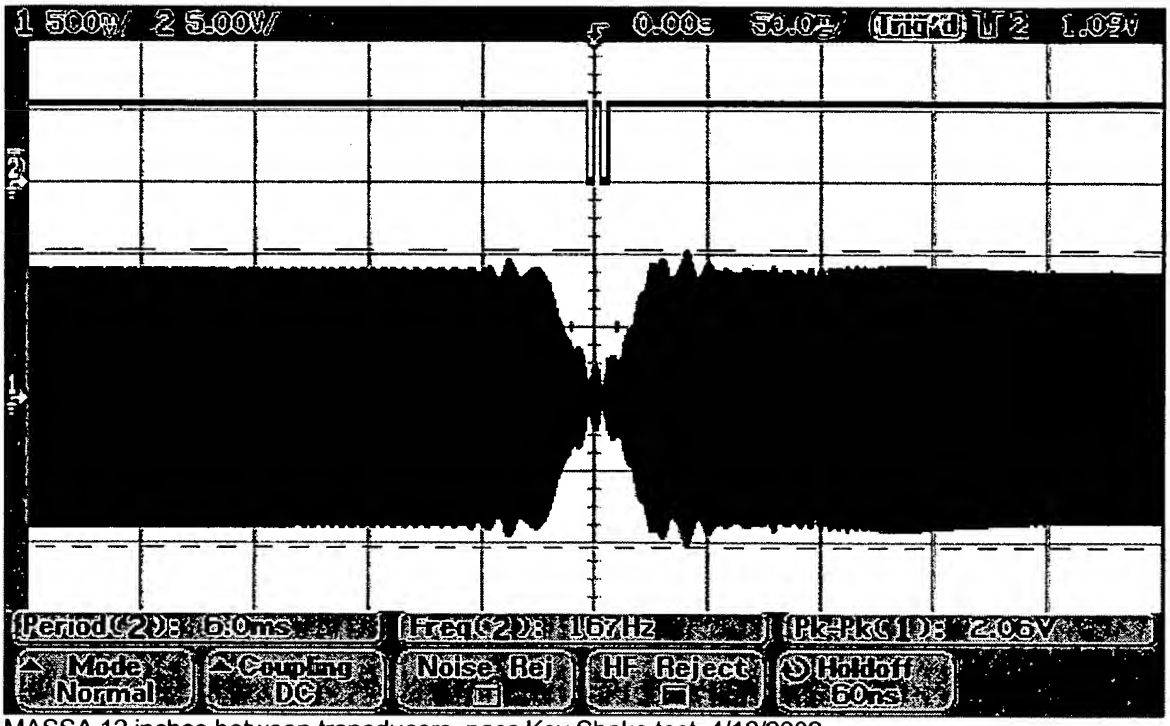

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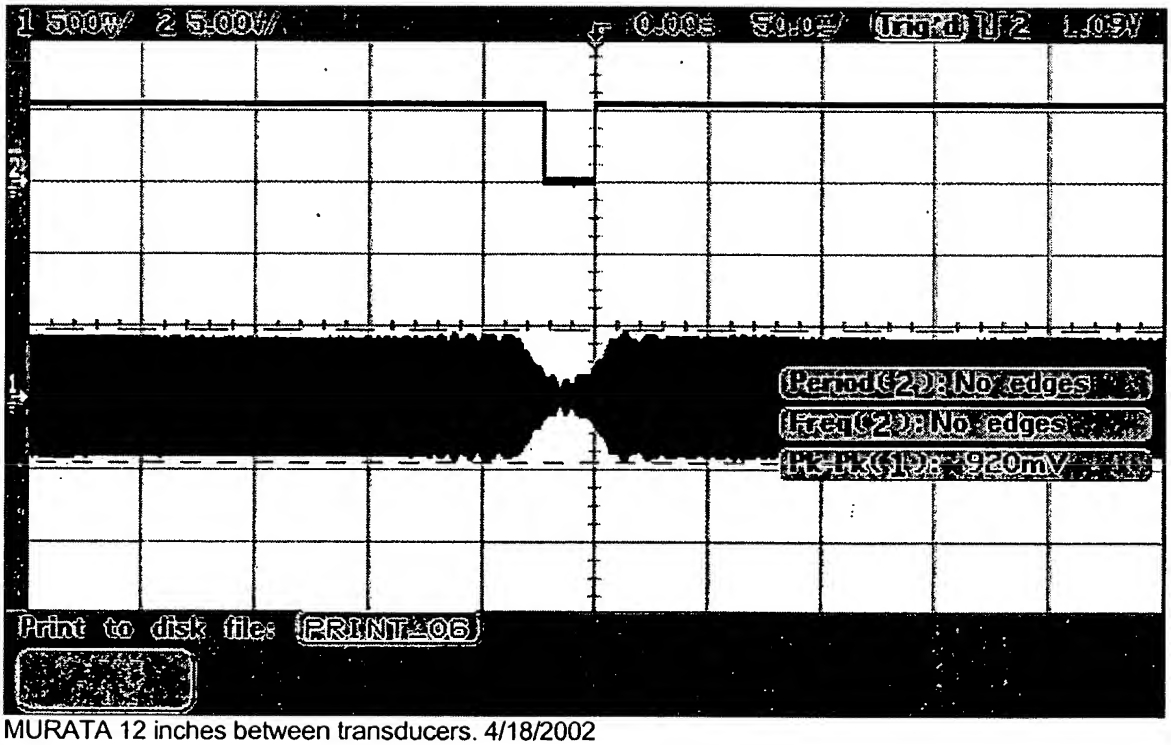

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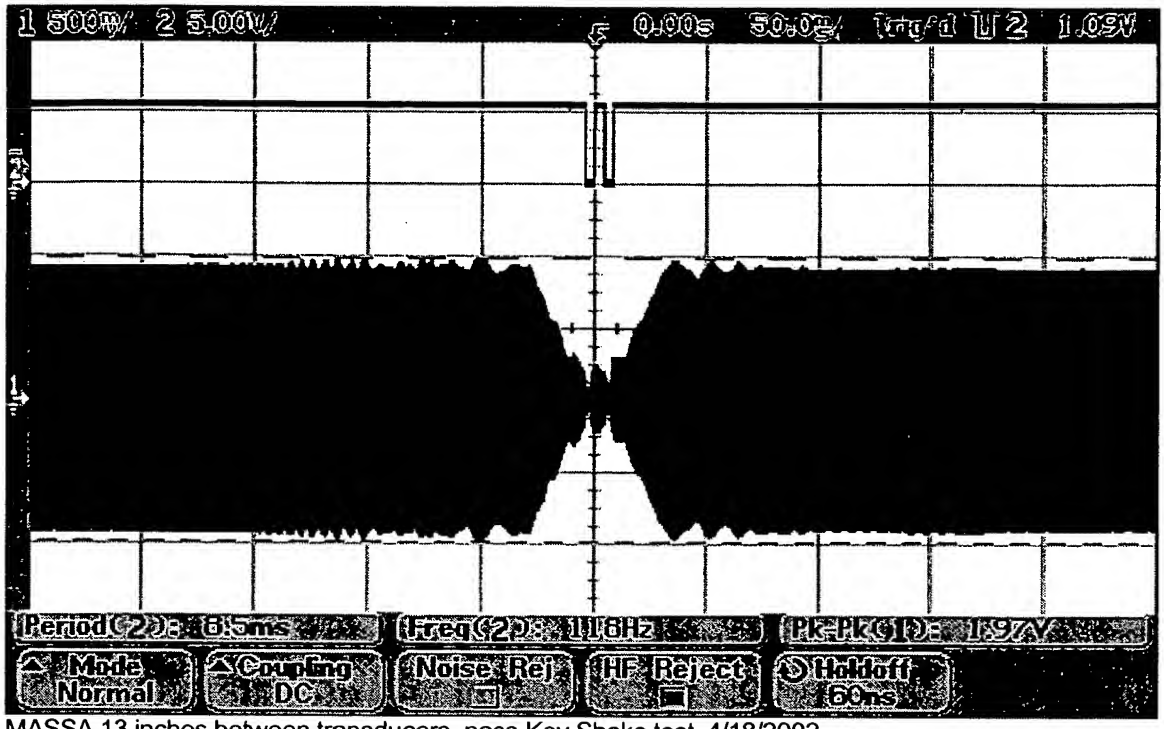

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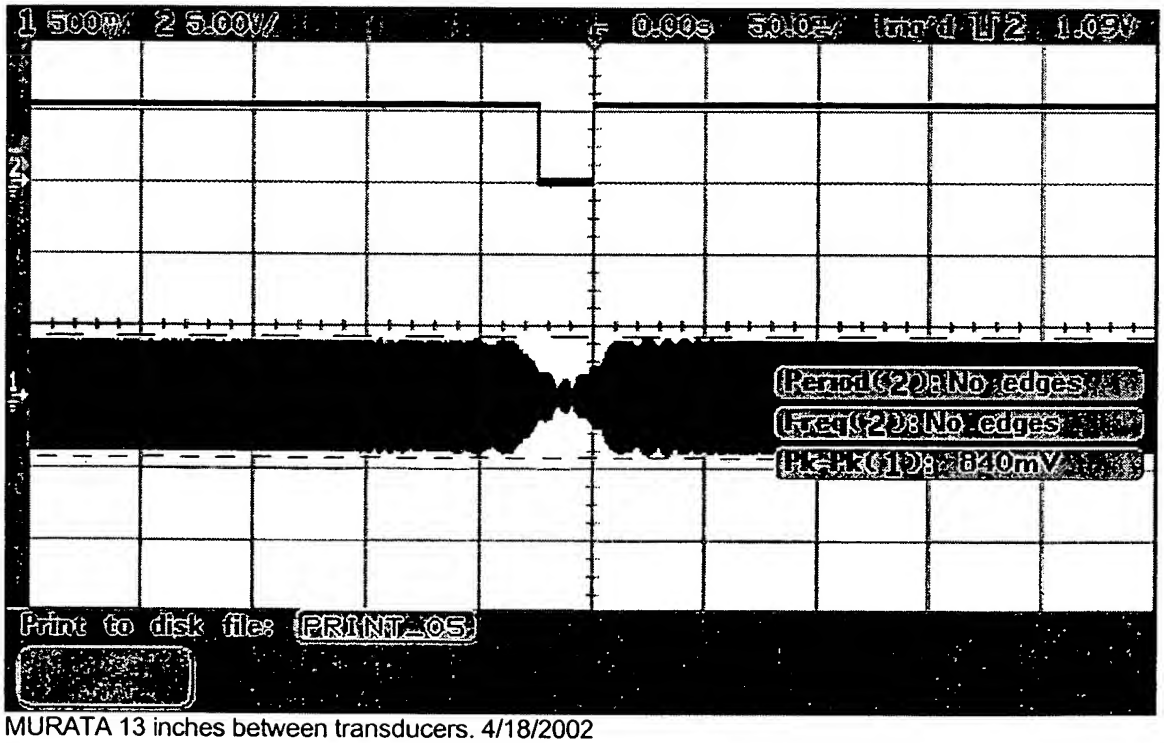

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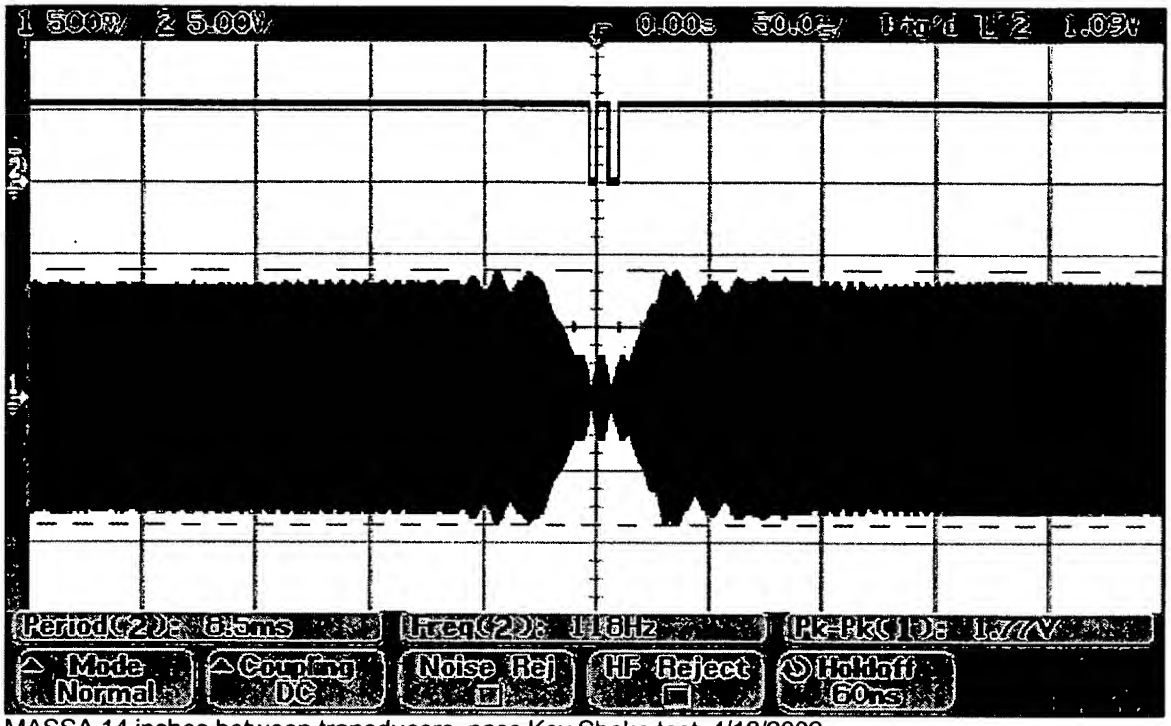

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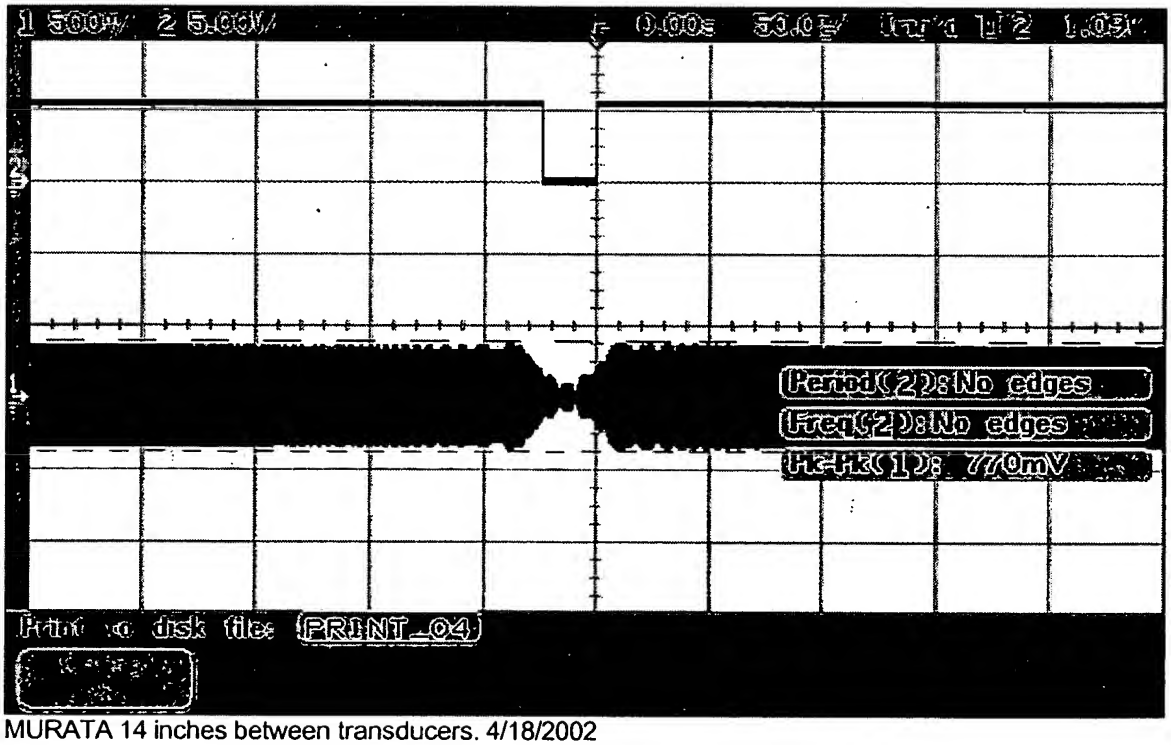

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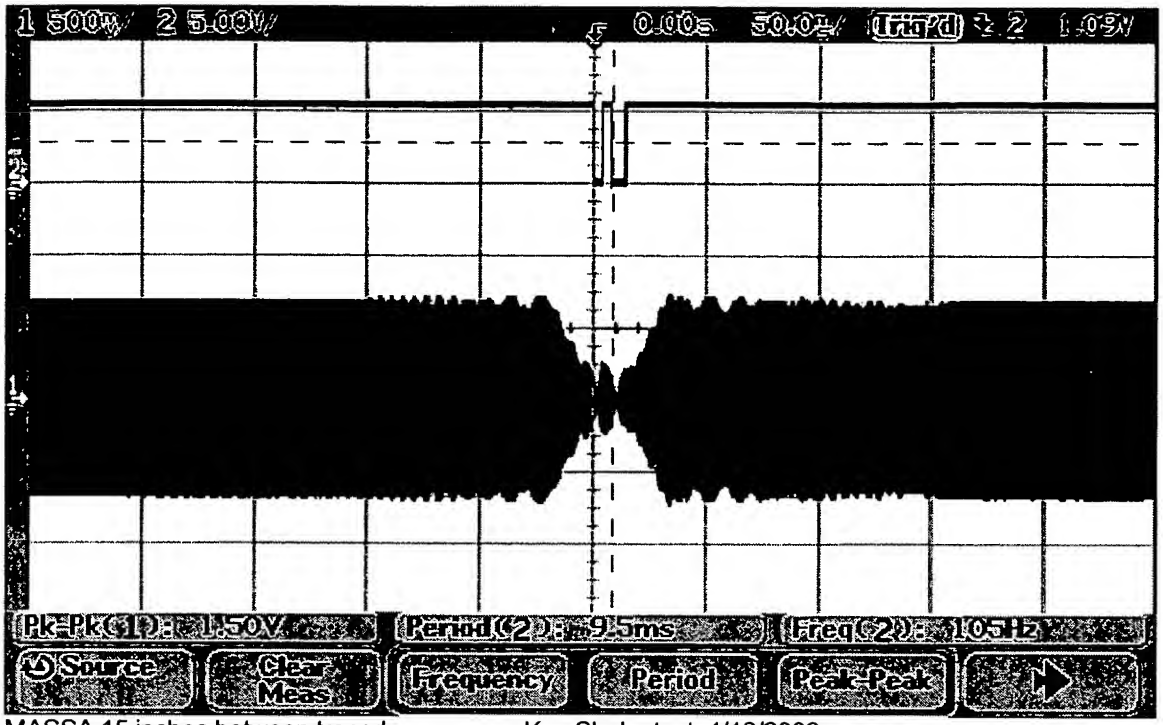

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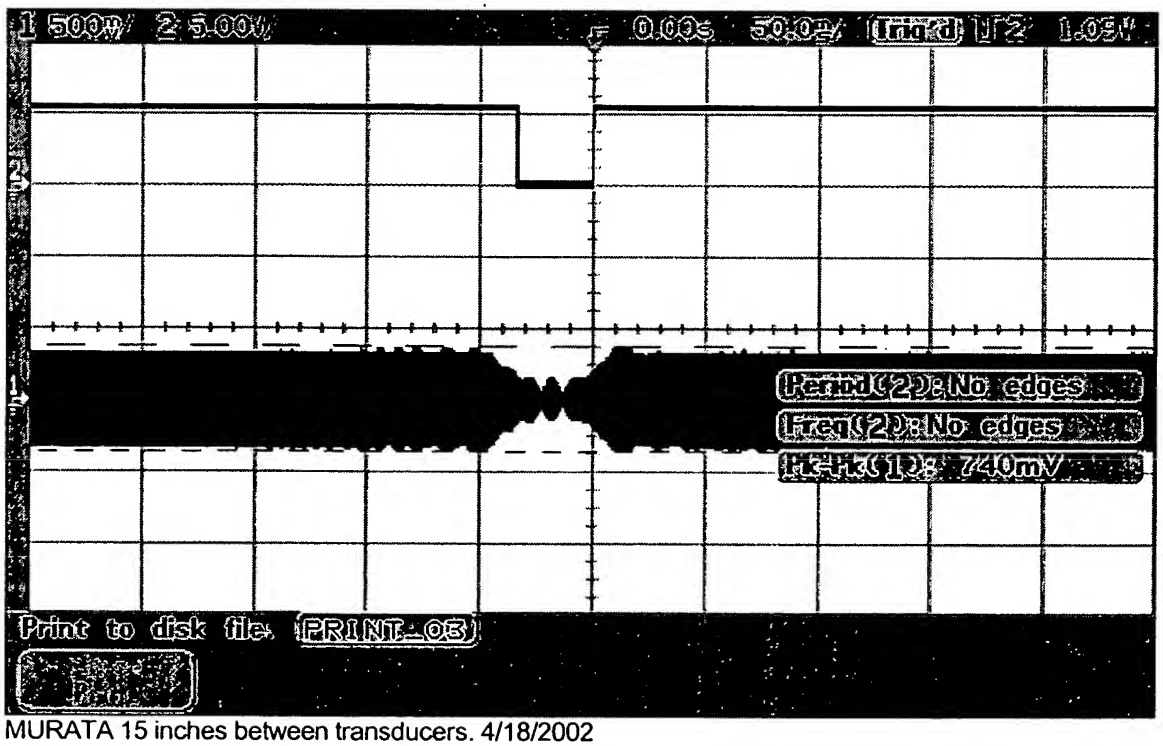

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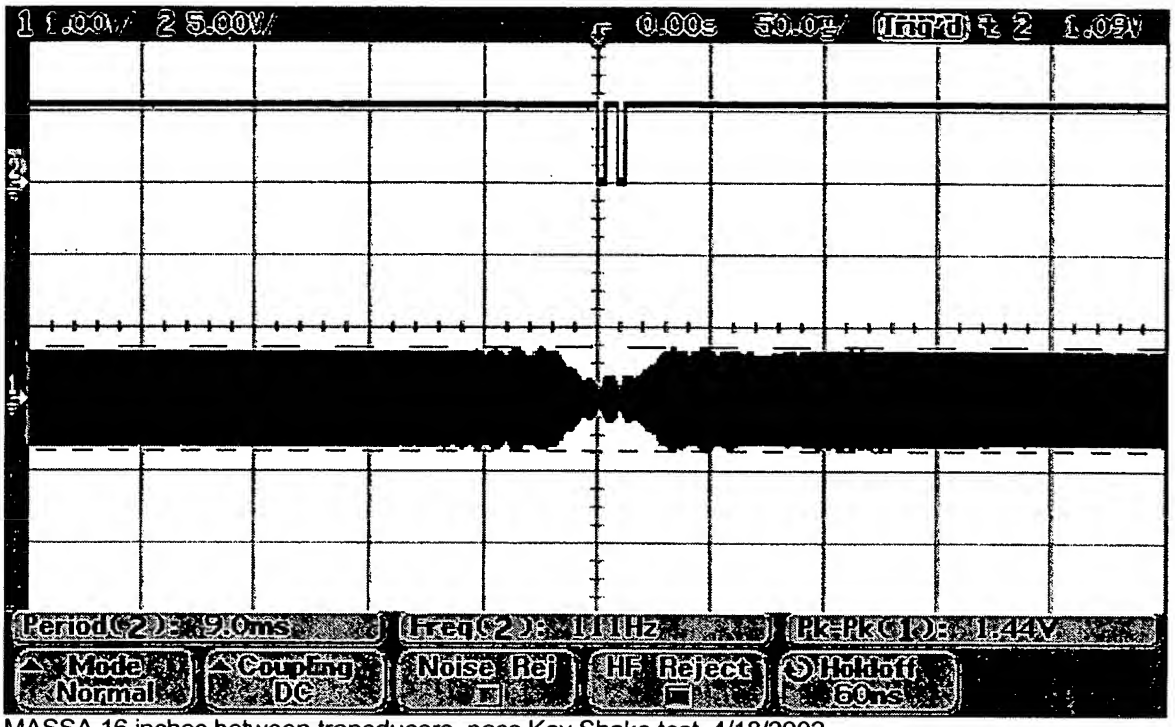

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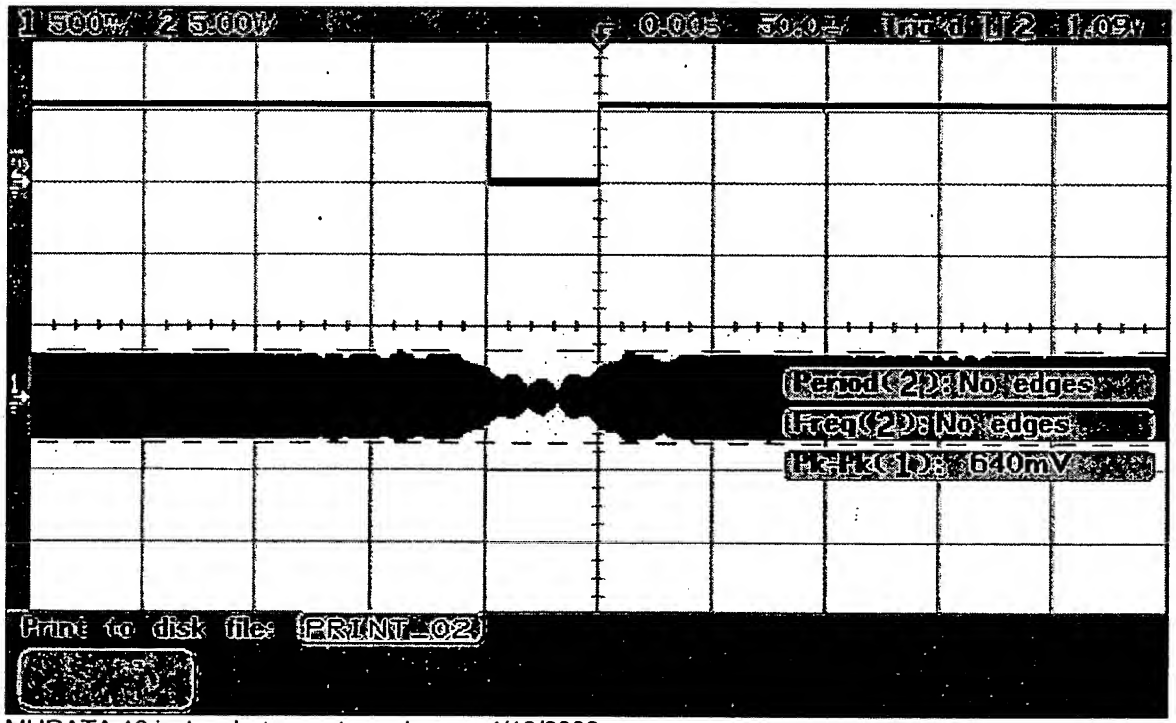

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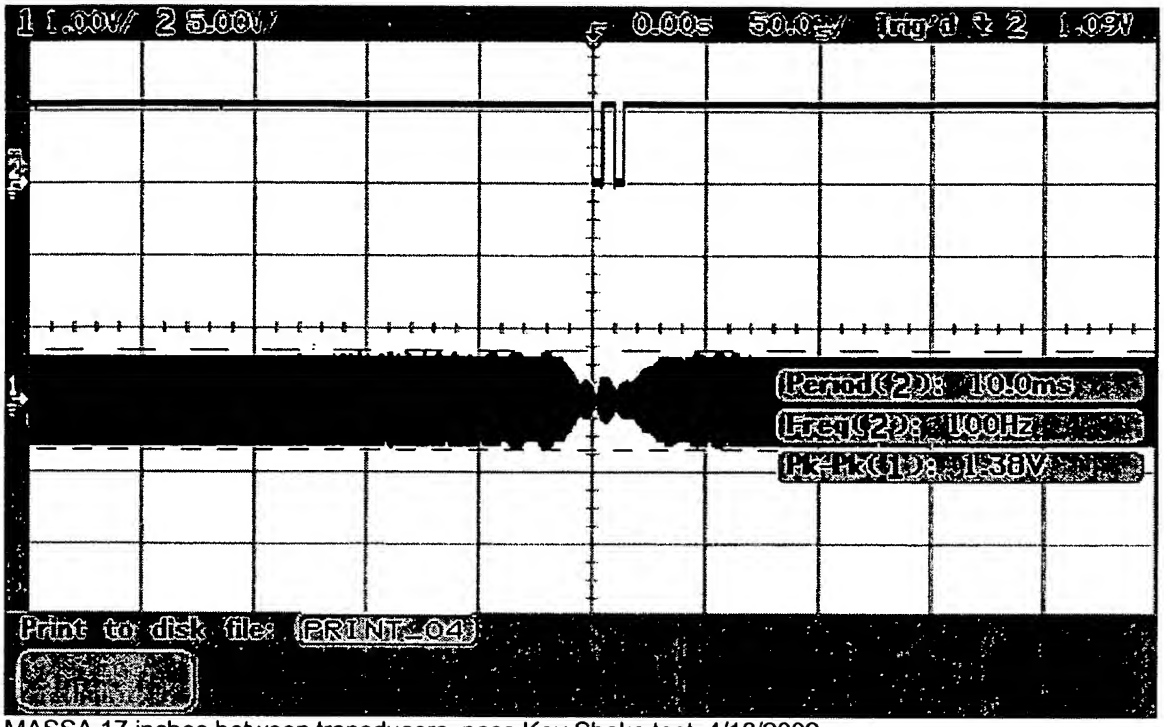

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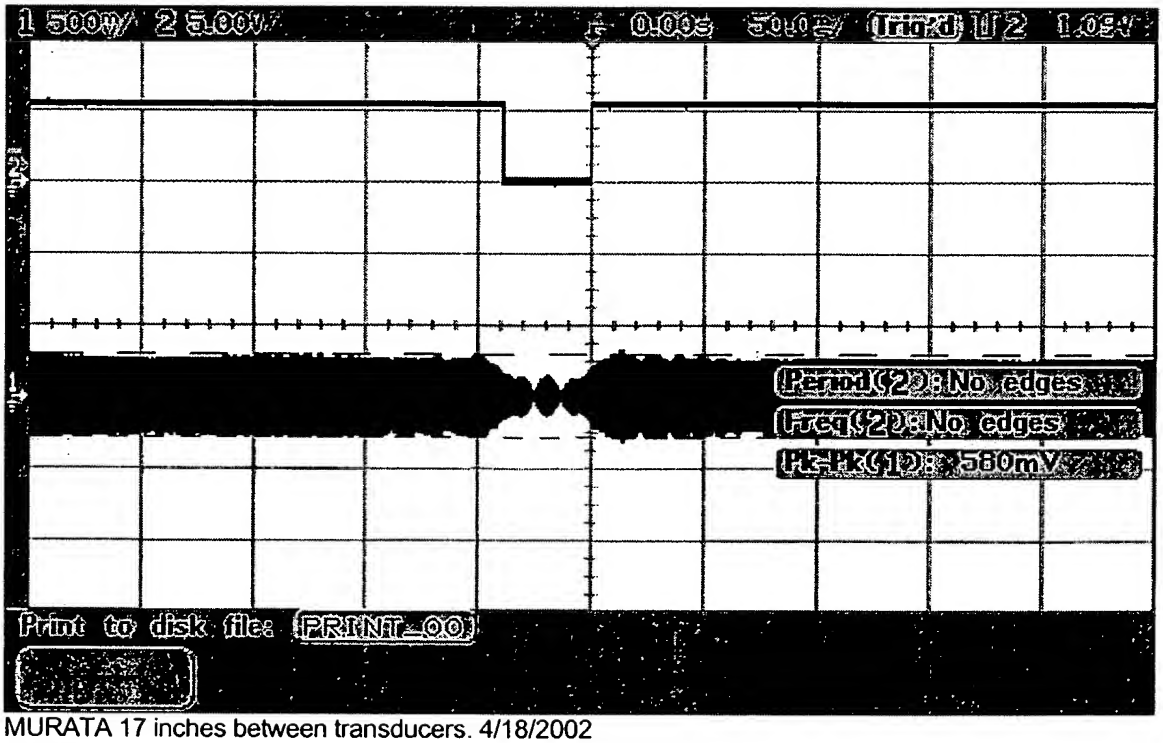

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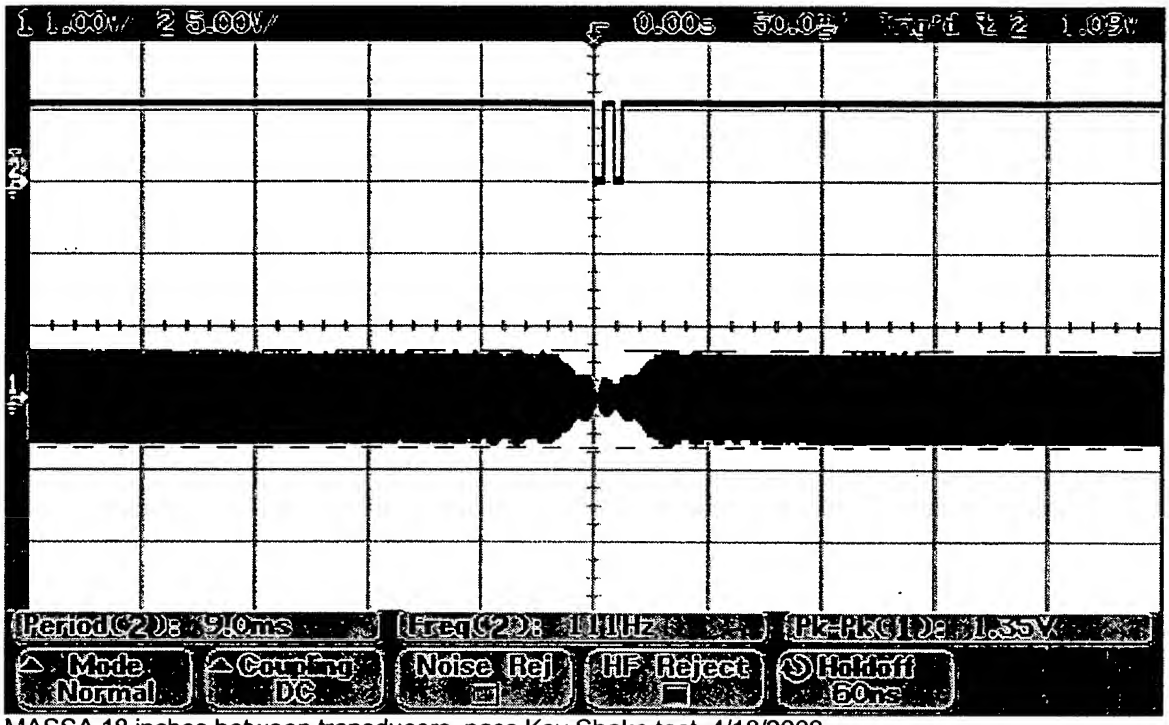

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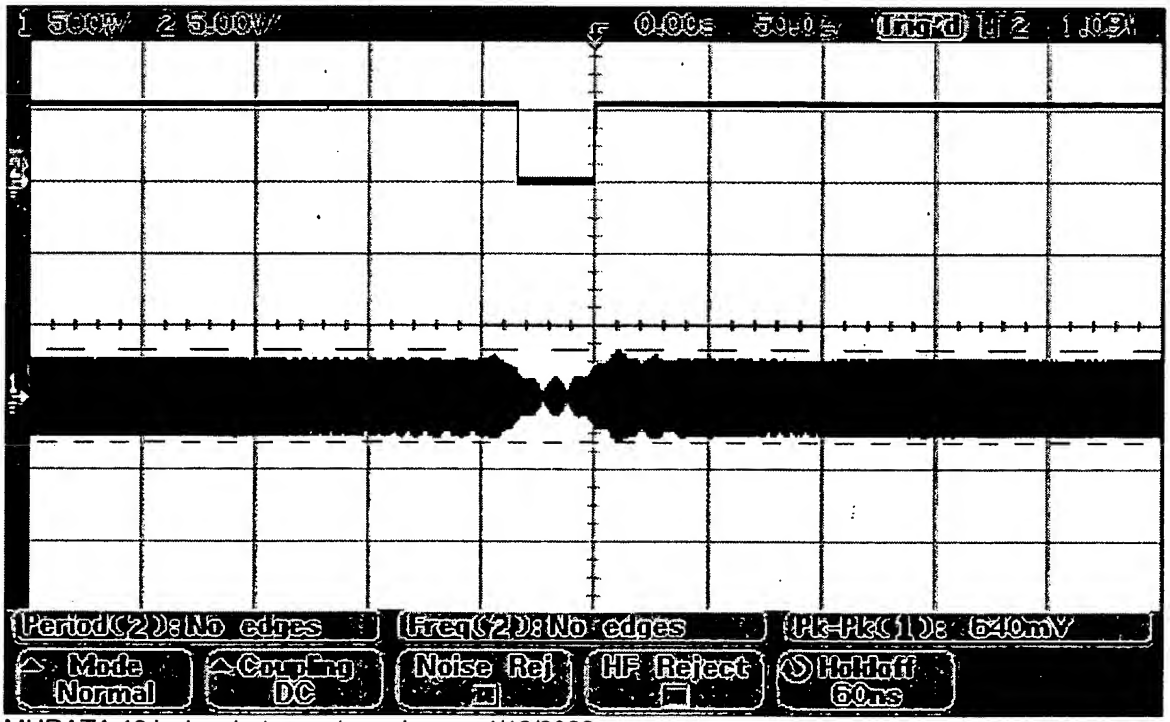
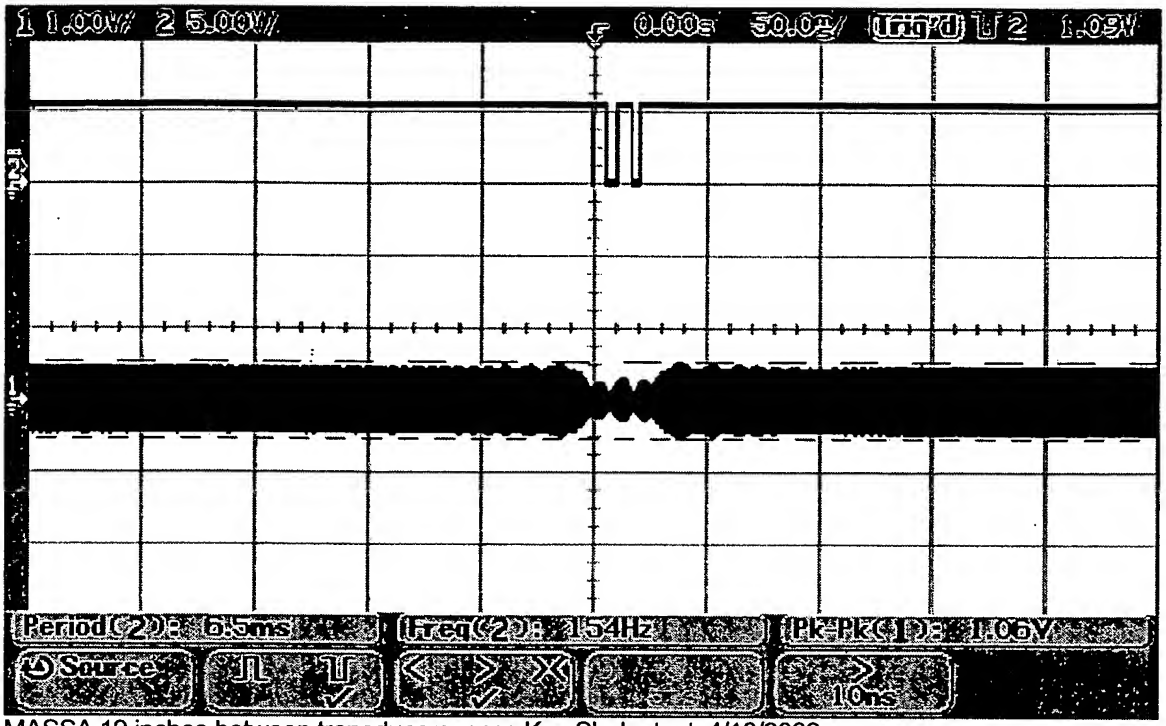
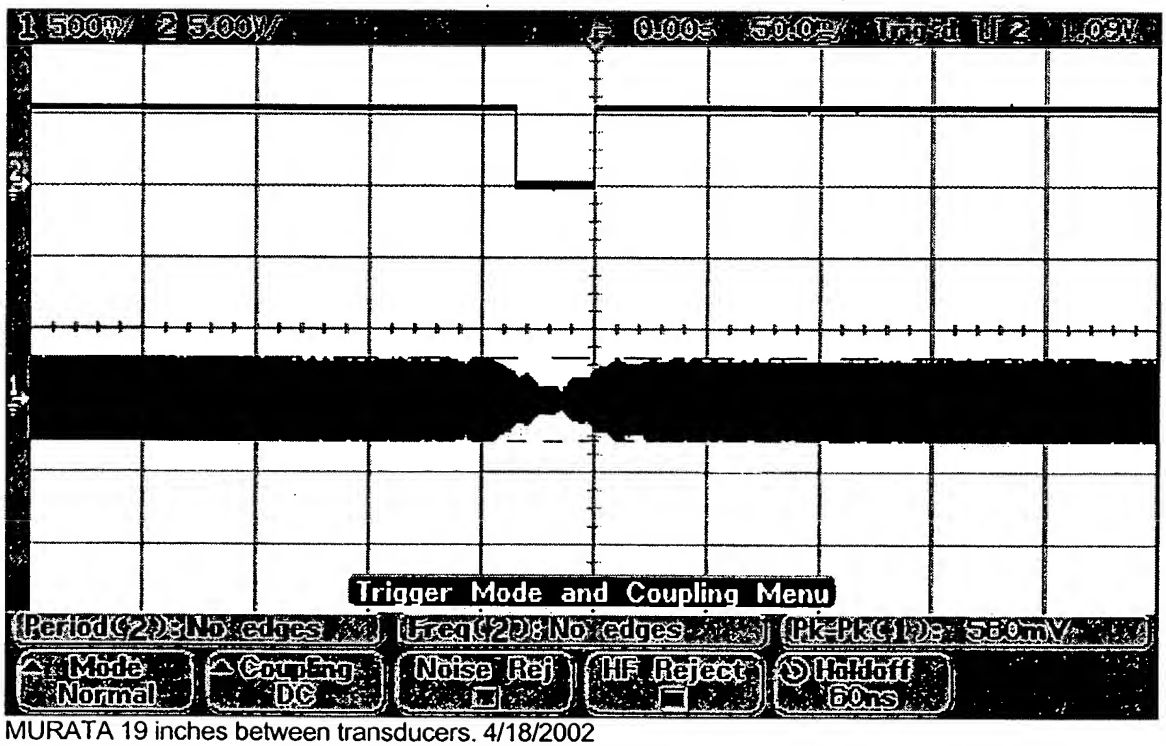


MURATA 18 inches between transducers. 4/18/2002



MASSA 19 inches between transducers, pass Key Shake test. 4/18/2002



MURATA 19 inches between transducers. 4/18/2002